MUSIC AND PERFORMANCE: THE EFFECT OF ATTITUDE

By

CHARLES VERNON DURHAM

Bachelor of Arts

San Jose State College

San Jose, California

1963

Submitted to the faculty of the Graduate College
of the Oklahoma State University
in partial fulfillment of the requirements
for the degree of
MASTER OF SCIENCE
May, 1967

MUSIC AND PERFORMANCE: THE EFFECT OF ATTITUDE

Thesis Approved:

William W. Rambo
Thesis Adviser

Ray O. Bu

Roy Gladstone

N N Durham
Dean of the Graduate College

ACKNOWLEDGMENTS

I wish to express my appreciation to the members of my committee for their assistance in the preparation of this thesis. I especially want to thank Dr. William Rambo, my adviser, for the many hours he devoted in guidance of this research project; Dr. Roy Gladstone for his suggestions for clarification and Dr. Larry Brown for his worthy counsel.

Special plaudits are due my wife, JoAnn, for her sacrifice, encouragement, and aid during the course of this graduate study and the preparation of this thesis.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

BACKGROUND OF THE PROBLEM

The extensive use of background music in stores, offices, and factories suggests that music must have a beneficial effect on work output and/or on morale. Experimental results have demonstrated that music can indeed increase work output. A recent study by Konz (1962) found that college students performed better ($p = .001$) when listening to programs of Muzak-prepared background music while comparing nonsense letters and doing a manual assembly task. But experimental findings have not always been successful in demonstrating such an effect. For example, McGehee and Gardner (1949) reported that rug setters' production was unaffected by music, and Obata (1934) concluded that music, even when played softly, had a deleterious effect on the performance of his subjects on varied tasks. Henderson, Crews, & Barlow (1945) found that music hindered work demanding mental concentration, but Smith (1961) found that it did not adversely affect output, error rate, or absenteeism. Freeburne & Fleischer (1952) concluded that reading speed was increased by music while Smith & Curnow (1966) found that music played in a supermarket did not affect buying habits of the customers. These results suggest that the way music affects performance may vary from one situation to another.

According to Wokoun (1963) much less attention has been given to the ways that different types of music can influence performance. The frequently used phrase "effect of music on performance" suggests that

investigators consider musical selections at least roughly interchangeable. While they do, of course, specify the music they have used, there is a strong presumption that results would have been about the same with any other program of music that had been selected. Actually, the relattionship might be still more complex.

Farnsworth (1958) states that in situations where the work is complex or requires mental concentration, the type of music found to be appropriate resembles little the kind used for workrooms where the labor is more manual. Morgan (1956) suggests that the types of music used must be adjusted to not only the work being performed but often to the time of day. Several experimenters have demonstrated the value of these speculations.

Soibelman (1948), in an industrial situation, demonstrated that job complexity was a factor that had to be considered when discussing the effects of music on performance. Using 100 workers of mixed experience on a relatively simple job, the total output per 100 man-hours increased 11.4% during a week with music, as against one week without music. However, in another test with highly skilled workers (complex job) in which music was played for three weeks, the results showed an increase of only 4.1% over a similar period when no music was played.

Diserens (1939) measured the effects of background music on typing ability. Ten people skilled in this task were given material to type which had been specially chosen for its lack of intrinsic interest. The subjects were first allowed to warm up and get used to the machine. A normal typewriter record was then taken. At a given time the subject was told to start and continue typewriting as rapidly as possible until told to stop. At the end of two minutes the stop signal was given and

two minutes elapsed before the test was repeated with a musical accompaniment.

The number of errors and the total number of movements made by the typist were analyzed. Total movements included the number of letters written, number of punctuation marks, and number of spacing and shifting motions. In his analysis Diserens found that the music had had a negligible effect on performance.

In later experimentation by the same researcher (Diserens, 1939) a simple rather than complex task was used, and significant results were obtained. In this second study, the experimenter required several subjects to operate a hand dynamometer, some in the presence of music and others under normal no-music conditions. He concluded that the music had had a positive effect in that it tended to reduce or delay the course of fatigue.

Several other authors (Cardinell, 1943; McDaniel, 1945; Lundin, 1953) have obtained similar results and also suggest that the type of music used must vary according to the complexity of the work involved. Another group of experimenters have approached this problem in a different way.

Middleton, Fay, Kerr, & Amft (1944), in an attempt to demonstrate more effectively the relationships between music and performance on a task, designed an experiment which utilized two different types of music. In this study the subjects were simply required to evaluate how they felt, whether rested or tired and/or pleasant or unpleasant. These evaluations were made while the subjects were either listening to a popular-vocal selection or a waltz-instrumental composition. The experimenters found that both men and women rated themselves as feeling less tired and

less unpleasant when they were listening to either type of music.

Henderson, et al., (1945), using two types of music which were labeled "classical" and "popular", studied the effects of this music on reading ability. They found that the popular music significantly distracted a group of subjects on the paragraph section of the Nelson - Denny Reading Test. The classical music, however, did not distract the subjects but actually helped them read faster.

Jensen (1931) found that two types of music, labeled "jazz" and "dirge", each caused slight but different variations in typing efficiency. He concluded that jazz had no effect on the speed at which his subjects performed but it did increase their errors. Dirge music, on the other hand, decreased typing speed but had no effect on errors.

The studies just cited indicate, as suggested by Wokoun (1963), that the relationships between background music and performance variation are very complex. This writer feels, however, that from the research available no conclusions can be reached as to the form of this relationship. Types of music previously used have been broadly defined and depend heavily upon an individual's understanding and appreciation of music. Thus far the actual characteristics or properties of music (e.g., rhythm, tempo, etc.) have not been manipulated in any systematic fashion to determine the ways in which these intrinsic properties produce variations in behavior. This author feels that experimentation with these characteristics would provide much valuable information relating to the reasons for performance change with background music.

Yet another distinct variable in this type of research is the attitude the employee or subject has toward the music used; that is, how he "thinks" the music will affect his performance (Chapanis, 1949). The

word "attitude" as used in this context is defined as "...a readiness to act in one way rather than another in connection with specific factors related to a job" (Hefley, 1963, p. 1).

In 1937 Kenneth H. Baker conducted an experiment in which he attempted to show the importance of the attitude variable. His study demonstrated that the attitude engendered within a subject either by his own self-instruction or by inadvertent comments made by the experimenter could affect greatly his performance on a given task.

Using a simple task of addition as his dependent measure, Baker demonstrated that subtle implications concerning the outcome of the experiment, provided by the experimenter through instructions, caused performance between groups of subjects to vary significantly. Basically he had four groups of subjects, each of which he led to believe would be differently affected by background music playing while they performed the task. Baker found that the outstanding characteristic of the data from these groups was there general conformation to the suggestions given by the experimenter at the beginning of the study.

Several experimenters have obtained estimates of their subjects' attitudes toward music (Henderson, et al., 1945; Middleton, et al., 1944), but none with the exception of Baker (1937) has attempted to control this factor.

Statement of the Problem

Baker (1937) used only one type of music, which he does not name, in his research project. Again, it seems that the music used is to be considered interchangeable with any other type. No particular characteristic of the music could be pointed to as more important than any of the others in providing the obtained results. It is felt by this author that

much information was lost by not defining the music and discussing it in a more meaningful manner.

The purpose of this research was to determine the effect of an experimentally created attitude on performance when background music was being played. Because of the design of this experiment the task used was different from that employed by Baker and the types of background music used were also varied. Two hypotheses were investigated:

I. The attitude induced by the experimenter through the instructions given the subjects would affect their performance in the manner suggested.

II. The variation in type of background music played would not affect performance.

Because of the difficulty in controlling the variables in an experiment conducted in a factory, this investigation was done in a University laboratory.

CHAPTER II

METHOD

Subjects

Although a number of subjects were used in a pilot study to test the adequacy of the experimental materials and procedure, this report is based on data from 160 subjects used in the experiment proper. The subjects were chosen randomly from introductory psychology classes at Oklahoma State University. They received extra credit for participation in the experiment.

Apparatus

Music. In order to more effectively control and interpret any effects that might be caused by the music, tempo was used as the characteristic for differentiation between types. Tempo as used in this context is defined as the number of beats per minute in a musical composition. This could be contrasted with the rhythm of a musical selection which refers to the number of beats per measure of the music.

The music for this study was specially chosen to allow for the desired tempo variation without distorting the composition. The songs used were Arioso by J. S. Bach, Traumerei and Romanza by R. Schumann, and Thanks be to Thee by G. F. Handel.

The music was arranged for and played by a piano and organ in duet. There were no voices used in either of the selections. It was recorded initially at 48 beats per minute, and then recorded again on a second

tape at twice the first speed (96 beats per minute). The respective tempos were kept uniform by using a metronome.

The recordings were made on a high quality R. C. A. Polyester based tape. For a finer reproduction the music was recorded at 7½ inches per second. The tape recorder used was a Sony, T - C 500, serial number 20699.

All variables associated with the music, other than tempo, were kept constant for all subjects. For example, rhythm and orchestration were equated by presenting the same musical selections, recorded with the same instruments, to all groups. The volume at which the selections were recorded was kept constant through the use of a decibel meter located on the tape recorder.

Task. The task used in this study was originally suggested by Starch (1911). It is basically a symbol substitution exercise in which rows of numbers are substituted for rows of letters. The substitutions are made utilizing a special pattern in which the letters of the alphabet are associated with certain numbers (see Appendix A).

The subjects were given specially prepared booklets in which they worked on one page for ten minutes, then turned to the next page and began working again. There were seven of these pages placed randomly in each booklet. The pattern was present on each page and was the same for all pages. The sentences to be transcribed differed from page to page.

This task was chosen because it required both mental and manual dexterity. The subjects were told to work as rapidly and as accurately as possible and that they would be given credit for the total number of correct substitutions.

Equipment. The tape recorder mentioned earlier was positioned

within the experimental room in such a manner that it could not be observed by the subjects. Dependent upon which group of subjects were being tested, the recorder contained a tape of one of the two tempos to be used in the study.

Procedure

The 160 subjects were randomly divided into eight groups of 20 each. The two levels of the tempo factor and the four levels of the instruction factor (to be discussed later) were then randomly assigned to the groups. This randomization procedure evolved a 2x4 factorial arrangement of treatments with 20 observations under each combination.

The subjects to be tested under a specific treatment combination were called into the testing room and seated in chairs. The experimenter introduced himself to the subjects and gave a brief background into the reasons and purposes of the present study. Dependent upon the particular group of subjects being tested, the remainder of the instructions varied.

Group I (Control). This group of subjects was told that they were to serve in an experiment to determine the effects of music on performance. No statement was made regarding the supposed effects of the music until after the experiment was completed. If the subject asked what the effect of the music was supposed to be, he was told that was the purpose of the experiment itself and that the answer might be forthcoming when the study was complete.

Group II (Suggested Interference). These subjects were told that they were to serve in an experiment to determine the effects of music on performance. In addition, they were told that the purpose of the present experiment was that of checking and extending an earlier work. The

results of the previous hypothetical experiment, as in Baker's (1937) study, were shown the subjects in the form of a graph. The graph contained two curves, one red, labeled "with music", and one green, labeled "without music". Both curves showed the negative acceleration characteristic of some learning curves. The red curve, however, was always below the green one, indicating poorer performance in the presence of the music. The graph was placed on the wall of the experimental room so that it was easily seen during the entire experiment. In this manner the subjects were led to believe that this experimenter's previous study tended to indicate that, with respect to this simple task, a person is apt to perform worse when working in the presence of music than when working under conditions of quiet. In all other respects, the subjects in this group proceeded in the same manner as those in Group I.

Group III (Suggested Facilitation). These subjects were given the same instructions as those in Group II except that they were told that this experimenter had found in previous investigation that background music facilitated performance on the task. The curves presented differed from those shown Group II only in that the red curve was always above the green curve. The red curve again was labeled "with music" and the green curve "without music". This graph was also placed so that the subjects could see it throughout the experiment. As a result, the subjects in this group were led to believe that a person is inclined to do better work with the extraneous stimulus present.

Group IV (Suggested Crossover). This group performed under the same conditions as did Groups II and III, except they were informed that in the previous hypothetical study it had been found that at first the extraneous stimulus had shown an inhibiting effect, but with a few minutes

practice the results had been reversed. In the graph presented, the curves crossed between the fourth and fifth ten minute experimental period. The red curve - "with music" - started out below the green - without music" - but by the seventh time interval was considerably above it.

Each subject participated for 90 minutes in this study. This time was divided into eight different periods. Period one, 20 minutes in duration, was used by the experimenter for presenting instructions. Period two, ten minutes in duration, was considered a practice period and served to bring all subjects to approximately the same level of ability in regard to the task. The remaining six 10-minute periods were used for the gathering of data and are referred to in the following paragraphs.

Since it is felt by most authors (Konz, 1962; Benson, 1945; Smith, 1947; Muzak, 1963) that music should be present during only part of the working period, the music and no-music situations were alternated over the six 10-minute intervals. These periods were counterbalanced between groups to control for any effects caused by the order of presentation. However, since the analysis to be used depended on average differences between music, no-music intervals a restricted counterbalancing pattern was used. The two patterns chosen were first, a music (A), no-music (B) order and second, a no-music (B), music (A) order. These two patterns were then randomly assigned to the eight experimental groups. Consequently, four of the groups received the AB order and four received the BA order. In both cases, however, all groups were exposed to the three compositions and music was present one-half of the time.

After each session the experimenter presented to the subjects a Thurstone - type attitude scale to determine their feelings toward the

music they had heard (see Appendix B). This scale was developed and used in an earlier work by Wokoun (1963).

The danger of communication between the members of the various groups was minimized by informing the subjects that discussions of the experiment with others was not desirable. They were told that such discussions might have a positive effect on the scores of the subjects who served in later groups and would thus indirectly have an adverse effect on earlier subjects' scores. It was later verified that most subjects had said nothing about the experiment to friends, with the exception of some who had mentioned that they were taking part in a psychological experiment.

CHAPTER III

RESULTS

For each subject, the number of symbol substitutions made during the three music periods was subtracted from the number made during the three no-music periods. These resultant differences were considered the total scores for each subject. Since some of the scores were negative, a constant was added to all numbers to remove minus signs.

An Analysis of Variance (AOV) was performed to determine the effects of the treatments (instructions) used and the variations in music (tempo). This AOV is presented in Table I. The test for instructions was significant at the .001 level. The test for performance variation associated with the two levels of tempo was not significant. These tests tend to indicate that both hypotheses postulated for this experiment are confirmed. However, as mentioned earlier, the music, no-music conditions were presented in a counterbalanced order. Consequently, in the statistical layout of the data it was expected that half of the subjects would receive music in the first non-practice period and half would receive it in the second non-practice period. It was assumed that through a process of randomization this counterbalancing would present no special pattern. Due to the way the randomization process evolved, however, all the subjects in Groups I and II received a music period first, followed by a no-music period (eg. AB order). The subjects in Groups III and IV received just the reverse, or the BA order. As a result, any effects

TABLE I

ANALYSIS OF VARIANCE - TOTAL SCORES

SOURCE	df	SS	MS	F
Total	159	69616.37		
Instructions	3	18908.47	6302.82	20.57**
Tempo	1	592.90	592.90	1.94
I x T	3	3548.20	1182.73	3.86*
Error	152	46566.80	306.36	

** p = .001

* p = .05

due to these orders are confounded with treatments.

The first 10-minute period for each subject was considered practice and was not used in the computation of differences reflected in the AOV in Table I. A test was made on these first-trials to insure that all groups were equated on first trial performance (See Table II). The resultant F ratios were not significant, indicating that all subjects were initially homogeneous in ability at performing the task and susceptibility to any effect of the music.

The Duncan's Multiple Range test was used to make comparisons between the four treatment means (See Table III). These comparisons indicated that the interference instructions (Group II) caused a change in performance which was not significantly different from the control (Group I). And that the crossover (Group IV) and facilitating (Group III) instructions caused performance changes which were in the positive direction and significantly different from the control conditions. (In Table III it will be noted that T_3 and T_4 have smaller means than T_1 and T_2. This would seem to imply that Groups I and II performed better than Groups III and IV. This is not true, however. As mentioned earlier in this paper, a constant number was added to remove minus signs from the AOV. Consequently, if the number to which the constant was added was large and negative - indicating better performance with music playing - the resultant positive number would be small. Therefore, $\overline{T}_3$ and $\overline{T}_4$ actually indicate a better performance rate in the presence of music even though their numbers are smaller.)

The scores of the subjects in Group IV (crossover) were analyzed to determine whether or not the music had had the changing effect on performance initially suggested by the experimenter. The difference between

TABLE II

ANALYSIS OF VARIANCE - PRACTICE PERIODS

SOURCE	df	SS	MS	F
Total	159	245203.24		
Instructions	3	5285.56	1761.85	1.17
Tempo	1	3053.75	3053.75	2.02
I x T	3	7270.48	2423.49	1.60
Error	152	229593.45	1510.48	

TABLE III

DUNCAN'S MULTIPLE RANGE TEST

S.S.R.	L.S.R.
3.64	10.01
3.80	10.45
3.90	10.72

$\bar{T}_3$	$\bar{T}_4$	$\bar{T}_2$	$\bar{T}_1$
38.73	44.58	62.33	63.63

the number of substitutions made by each subject on adjacent music, no-music periods was determined. These differences were computed by subtracting the score obtained in the presence of music from that obtained without music. Using this procedure, three differences were computed for each subject. If these three resultant numbers were being influenced by the instructions given, they would have some form of a positive - positive - negative relationship. (This would indicate an initial inhibiting effect associated with the music which, toward the end of the experiment, was replaced by a facilitating effect.) In the slow tempo group, ten of the 20 subjects displayed the suggested relationship. In the fast tempo group, only one of the subjects presented the suggested pattern. In other words, this latter tempo tended to negate the effects of the instructions. The majority of scores for this group, rather than approaching a positive - positive - negative pattern, approached a negative - negative - positive pattern. The music initially had a facilitating effect but as the experimental periods progressed, this effect became inhibiting.

It is interesting to note that the statistical results heretofore discussed from the four instructional conditions were corroborated by the attitude scales which were given each subject after the experiment proper. In the control group, 33% of the subjects agreed that the music distracted them. In the inhibition group, 55% of the subjects felt the same way. In the crossover and facilitation groups, however, 28% and 15% of the respective subjects agreed with the same statement.

To the attitude statement, "The music helped me relax and do a good job", 33% of the control group and only 13% of the inhibition group agreed. In the facilitation and crossover groups, however, 43% of the

subjects agreed with this statement. Finally, to the statement, "The music made the task seem easier", the respective percentages were as follows: control, 40%; inhibition, 13%; facilitation, 60%; crossover, 53%. These percentages not only supplement the statistical findings within this study but also demonstrate that this author's reliance on the effect of his instructions was justified.

In computing the data presented in this section it was observed that five of the eight groups utilized in this study displayed unusually high scores in the final experimental interval. These high scores were caused by the realization on the part of the subjects that the experiment was almost over; these inflections were not associated with the experimental procedures.

CHAPTER IV

DISCUSSION

As mentioned earlier, an order effect was completely confounded with treatments in this experiment. As a result, its significance was impossible to evaluate. In the search of the literature conducted for this study, however, no indication that an order effect might exist or be of any importance was found. In fact, some authors (Konz, 1962; Baker, 1937; Gilliland & Moore, 1927) consider it of such minor importance that they fail to mention it at all. This writer can think of no reason why an order effect should exist, unless it were caused by progressive response changes associated with the task (Wokoun, 1963).

Progressive response changes may either be positive or negative. When a person continues to work at a task over a period of time, his performance may improve because of learning or it may deteriorate because of factors such as fatigue or boredom. Since all subjects were allowed the same amount of practice on the task and served in the experiment for equal times, it can be assumed that these response changes, if operating, were random variables within groups.

The comparisons made by the Duncan procedure show that the facilitating instructions had approximately the same effect as the crossover; and the inhibiting instructions had an effect comparable to the control situation (See Table III). These comparisons suggest that the first two sets of instructions did provide positive and significant alterations in

behavior. The inhibiting instructions, however, did not significantly change performance patterns from those provided by the control group. This would imply that the instructions given Group II (Suggested Interference) had no effect. Or, they had an effect so slight that it could not manifest itself under the experimental procedures employed in this study. It should be remembered, however, that even though performance did not conform to the instructions given, the subjects' attitudes did. This fact is reflected by the percentages obtained from the questionnaire.

The relationships between non-significantly different treatments are also interesting for purposes of speculation.

In Group I only seven of the 40 subjects performed better while the music was present. This would suggest that when the subjects have heterogenous attitudes as to the effects of music on their performance, the music generally causes them to be distracted. These results appear to come in conflict with results from several earlier studies (Diserens, 1939; Henderson, et al., 1945). This contradiction is valid, however, only insofar as the subjects in these earlier experiments were not predisposed in some way regarding the effects of background music on the outcome of the experiment before they participated. Remarks regarding the presence or absence of such predispositions are almost always lacking in the published reports of earlier work in the field.

Statements such as "the subjects were unaware of the nature of the experiment" might be difficult to support, even though the experimenter himself has not explicitly divulged such information. Chapanis (1959) makes this point clear by stating, "Even if you give no instructions, the subject will set up his own implicit operating rules" (p. 227). And

Baker writes,

> If a subject is led into an experimental room and requested to perform some task under some unusual conditions such as the presence of an extraneous noise, he is immediately aware of the fact that he is being tested for the effect of that extraneous noise on his performance. This guess on the part of the subject may be entirely wrong, but is a determining factor in his behavior until told or shown otherwise (1937, p. 48).

In the suggested interference group, a total of nine of the 40 subjects did better with the music playing. This number, compared to the control, is close enough to be considered different only by chance.

In the suggested facilitation and crossover groups, the results reflect a different pattern. Each of the two groups contained 29 subjects who performed better with music playing. Group III subjects would be expected to perform better because of the direct, suggestive nature of their instructional set. Group IV, however, presents an identical pattern. It would seem in the case of this latter group that the suggested final effect caused a type of inverted performance change. This explanation is based on the fact that the facilitating effect was mentioned last in the instructional period. The possibility exists that the subjects working under this condition were influenced by the fact that the last thing they were told was that the music would have a positive effect. It seems these instructions thus had an inverted effect on performance, making it initially better but poorer at the conclusion. It should be mentioned, however, that the data tended to indicate a final approach toward another negative difference score. In other words, had the number of experimental periods been extended, the negative - negative - positive pattern probably would have entered a final negative phase. In this case, performance would have mirrored the suggestions given initially.

CHAPTER V

SUMMARY

This research was an attempt to control two of the major variables present, according to some authors (Wokoun, 1963; Chapanis, 1959), in experiments involving background music and performance.

The first of these variables, attitude, was evaluated by manipulating each subject's expectation as to how well he would perform on a given task. The second variable, music, was defined and controlled through the use of one important characteristic of all music, tempo. The hypotheses tested in this study were: (1) that the attitudes induced by the instructions given before the experiment would be the important determiners of performance change; and (2) that the changes in music (tempo) would not affect performance.

It was found that in this particular research the controlled attitude factor (Instructions) provided variations in performance which were significant at the .001 level. Unrestricted acceptance of the first hypothesis was hampered, however, by an order effect which was confounded with the treatment effects. (The reader is referred to Chapter III for a complete discussion of this order effect.)

The second variable, music (tempo), did not reach an adequate level of significance. Consequently, the second hypothesis was also confirmed.

Suggestions for Future Research

The major question raised by this study concerns the possibility that the music had no effect because of the characteristic used to differentiate between types. Perhaps tempo is not an important component of background music. It is suggested that other components of such music (i.e., rhythm, orchestration, tune, etc,) should be studied to determine which of them, if any, can be cited as precipitators of performance change. Prior research in this field has dealt with the music variable in very general terms (Soibelman, 1948; Diserens, 1939; Henderson, et al., 1945; Baker, 1937; Hall, 1952). This author feels that much more information can be obtained by breaking the music into its component parts and checking each of them individually.

The amount of time spent under the experimental conditions should be increased for each subject. A plot of the performance of each group over time revealed that no asymptotic values were reached. Seventy minutes did not seem long enough for the factors of fatigue and boredom to become important in performance. It would seem more appropriate for the subjects to work for longer intervals, which could be separated by some type of rest period. This procedure has been used by other researchers in the field (Konz, 1962; Konz, 1964).

Future experimenters in this area are advised to consider experimental designs which will eliminate all confounded order effects from their data. A simple counterbalancing procedure will not always handle this problem. On the other hand, if one can be sure that no progressive response changes will manifest themselves, or if they do, that they are controlled, an identical presentation of music no-music periods to all subjects would be appropriate.

If this study were to be replicated by the author, he would make one major change in the procedure utilized. The three 10-minute experimental music periods, per subject, would be combined into one single 30-minute period. Likewise, the three no-music periods would be presented one after another. The ultimate result would be that the subjects, after receiving a 10-minute practice period, would then receive either 30 minutes of music or 30 minutes of no-music, followed by an equal interval of the opposite condition. Since averages were computed to provide total scores for each subject, the above-mentioned procedure would not interfere with the statisitcal analysis of most of the data. Information would be lost, however, on Group IV (crossover). It is felt by the writer that the revised procedure would enable a better comprehension of the true effects of the factors used. It would eliminate most of the transitional adjustments that had to be made by each subject and would allow a better measure of the extended effects of each combination of treatments.

Finally, it is suggested that all sources of motivation for the respective subjects be carefully controlled. In this study the task was presented in a booklet containing seven pages. An analysis of the data revealed that five of the eight groups in this experiment displayed an unusually high score on the seventh trial. This seemed to be caused by the fact that the subjects realized the seventh page of the booklet was the last. And knowledge that the experiment was almost over seemed to be a motivating factor. In this project, this source of motivation was the same for all subjects. It is suggested, however, that the observed results might have been more conclusive had this source of motivation been eliminated.

A SELECTED BIBLIOGRAPHY

Baker, K. H. Pre-experimental set in distraction experiments. Journal of General Psychology, 1937, 16, 471-486.

Benson, B. E. Music and sound systems. New York: McGraw Hill, 1945.

Cardinell, R. L. Music in industry. In Dorothy M. Schullian & M. Schoen (Eds.), Music and medicine. New York: Henry Schuman, 1948.

Chapanis, A. Research techniques in human engineering. Baltimore: The Johns Hopkins Press, 1959.

Chapanis, A., Garner, Wendell R., & Morgan, C. T. Applied Experimental Psychology: Human Factors in engineering design. New York: John Wiley, 1949.

Diserens, C. M. A psychology of music: the influence of music on behavior. Cincinnati: Charles M. Diserens & Harry Fins, 1939.

Farnsworth, P. R. The social psychology of music. New York: Dryden, 1958.

Freeburne, C. M., & Fleischer, M. The effect of music distraction upon reading rate and comprehension. Journal of Educational Psychology, 1952, 43, 101-109.

Gilliland, A. R., & Moore, H. T. The immediate and long-time effects of classical and popular phonograph selections. In M. Schoen (Ed.), The effects of music. New York: Harcourt, Brace, 1927.

Hall, J. C. The effect of background music on the reading comprehension of 278 8th and 9th grade students. Journal of Educational Research, 1952, 45, 451-458.

Hefley, J. M. A study of job and life satisfaction in three employment groups. Unpublished masters thesis, Oklahoma State University, 1963.

Henderson, M. T., Crews, Anne, & Barlow, Joan. A study of the effect of music distraction on reading efficiency. Journal of Applied Psychology, 1945, 29, 313-317.

Jensen, M. B. The influence of Jazz and Dirge music upon speed and accuracy of typing. Journal of Educational Psychology, 1931, 22, 458-462.

Konz, S. A. The effect of background music on productivity of two different monotonous tasks. Paper read at Human Factors Society annual meeting, New York, November, 1962.

Konz, S. A. The effect of background music on the productivity of four tasks. Unpublished doctoral dissertation, University of Illinois, 1964.

Lundin, R. W. An objective psychology of music. New York: Ronald Press, 1953.

McDaniel, R. How music increases office production. American Business, 1945, 15, 22-24.

McGehee, W., & Gardner, J. Music in a complex industrial job. Personnel Psychology, 1949, 2, 405-417.

Middleton, W. C., Fay, P. J., Kerr, W. A., & Amft, F. The effect of music on feelings of restfulness - tiredness and pleasantness - unpleasantness. Journal of Psychology, 1944, 17, 299-318.

Morgan, C. T. Introduction to psychology. New York: McGraw-Hill, 1956.

Muzak. The sound of muzak, the science of muzak. New York: Muzak Corporation, 1963.

Obata, J., Morita, S., Hirose, K., & Matsumoto, H. The effects of noise upon human efficiencey. Journal of Acoustical Society of America, 1934, 5, 255-261.

Smith, H. C., & Tiffin, J. Employee attitudes, piece-work production a and industrial accidents. Applied Psychology Monographs, 1947, 14.

Smith, Patricia C., & Curnow, R. "Arousal Hypothesis" and the effects of music on purchasing behavior. Journal of Applied Psychology, 1966, 50, (3), 255-256.

Smith, W. A. S. Effects of incidental music in a work situation requiring complex mental activity. Psychological Report, 1961, 8, 159-162.

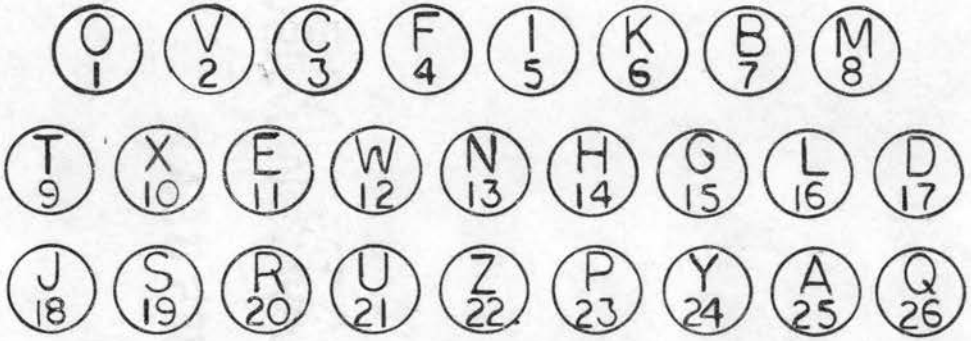
Soibelman, Doris. Therapeutic and industrial uses of music. New York: Columbia University Press, 1948.

Starch, D. Experiments in educational psychology. New York: Macmillan, 1911.

Wokoun, W. Vigilance with background music. Maryland: U. S. Army Technical Memorandum 16-61, AMCMS Code.

APPENDIX A

SYMBOL SUBSTITUTION TASK



they are apt to think they can do what others do; they work the mind and the body at the same time-when they begin to fail they only increase the effort, and nothing can be more foolish than this. They do not understand how to manage themselves, as the phrase is; the common rules of diet and exercise are hardly thought of by them. "I can study so much better at night" is the constant reply to the physician or elder friend who remonstrates; and they are apt to be assured that no practice which is pleasant to

APPENDIX B

Attitude Toward Music During The Experiment

Different people feel different ways about the music that was played in part of the experiment. The statements below represent several points of view. For each statement, please mark whether you:

A = Agree with it.
D = Disagree with it.
? = Are undecided about it.

___ The music made the task seem easier.

___ I'd have to work with music longer before making up my mind about it.

___ The music was really great.

___ The music made the task much easier for me by blocking out the noises from the hallway.

___ The music kept me from concentrating.

___ The music had no effect on me.

___ Sometimes I like to listen to music.

___ Hearing music really didn't bother me much.

___ I didn't like the tunes.

___ I just couldn't do my best without music.

___ The music wasn't too bad, but not too good, either.

___ Music is sometimes disconcerting.

___ The music helped me relax and do a good job.

___ I kept wishing they would turn the music off.

___ The music broke up the monotony and boredom.

___ The music is soothing to the nerves and makes you feel relaxed.

___ The music kept distracting me and caused me to lose concentration.

VITA

Charles Vernon Durham

Candidate for the Degree of

Master of Science

Thesis: MUSIC AND PERFORMANCE: THE EFFECT OF ATTITUDE

Major Field: Psychology

Biographical:

Personal Data: Born in Columbia City, Indiana, July 21, 1940, the son of Charles V. and Faye Durham.

Education: Attended grade schools in Larwell, Indiana, Buckeye, Arizona, Salinas, and Gilroy, California; graduated from Gilroy High School in 1958; received the Associate Arts degree from Hartnell College, with a major in business, in June, 1960; received the Bachelor of Arts degree from San Jose State College, with a major in psychology, in February, 1963; completed requirements for the Master of Science degree in January, 1967.

Professional Experience: Entered the United States Air Force in 1963, and is now a First Lieutenant in the Human Engineering research area; was an instructor in introductory psychology at the Oklahoma State University; is an active member in the Psi Chi professional psychological fraternity; and an associate member in the American Psychological Association.